

Errata in Memoir, vol. xliii.

Page 168, last line. For "0".78" read "-0".78."

„ 176, equation (10). For " $2V \{au - b + HPIV (1 - \Delta)\}$ "
read " $2V \{au - b + HPIV (1 - \Delta)\}$."

„ 179, line 4. For " $\frac{dp}{d}$ " read " $\frac{dp}{dt}$."

„ 185, line 20. For "south, preceding" read "south-preceding."

„ 191, line 3. For "0".223" read "0".023."

And in Tables &c., *dele* Star No. 10 and substitute from the Tables in the present article Star No. 8.

Reduction of the North Polar Distances of the Cape Catalogue for 1860 to Auwers' Standard. By A. W. Downing, B.A., T.C.D.

When comparing Catalogues together for such purposes as the determination of proper motions, it is of course necessary, where extreme accuracy is desired, to reduce the places of stars given in the different Catalogues to a uniform standard, so that the discordances peculiar to each individual Catalogue may be thus eliminated. The standard usually adopted for North Polar Distances is that given by Dr. Auwers in No. 1536 of the *Astronomische Nachrichten*, and in the present paper I have investigated the corrections which it is necessary to apply to the N.P.D.'s of the Cape Catalogue for 1860 to reduce them to this standard.

The Cape Catalogue has first been compared with the Greenwich Seven-Year Catalogue for 1860. There are 385 stars common to the Catalogues which are available for the purpose, after rejecting those whose places in either Catalogue depends on a single observation, and also two other stars, one passing the meridian very near the horizon of the Cape, and whose N.P.D. in the Cape Catalogue depends on only two observations, the other passing the meridian very near the horizon of Greenwich, the place in the Greenwich Catalogue depending on the same limited number of observations. These 385 stars have been arranged in order of N.P.D. and have then been taken in groups, each embracing about 5° of N.P.D., and, by taking the means of the N.P.D.'s and of the differences between the Catalogues for each group, I get 16 sets of mean differences extending from N.P.D. $49^\circ 51'$ to $124^\circ 34'$. These differences have been laid down and a curve drawn through the points which may be taken as representing the systematic differences between the Catalogues. The following Table gives the differences as computed and as read off from the curve.

N.P.D.		Number of Stars.	Gr. - C.	
°	'		Computed.	Curve.
49	51	4	+ 0.52	+ 0.58
57	48	5	+ 0.43	+ 0.53
62	43	21	+ 0.29	+ 0.50
67	44	36	+ 0.60	+ 0.48
72	24	20	+ 0.33	+ 0.45
77	29	25	+ 0.55	+ 0.38
82	32	27	+ 0.41	+ 0.33
87	26	25	+ 0.14	+ 0.31
92	30	25	+ 0.20	+ 0.38
97	44	31	+ 0.56	+ 0.42
102	56	15	+ 0.24	+ 0.39
107	35	38	+ 0.45	+ 0.33
113	2	25	+ 0.05	+ 0.24
117	19	47	+ 0.26	+ 0.17
121	33	28	+ 0.02	+ 0.12
124	34	13	+ 0.23	+ 0.20

The differences have then been read off from the curve for every 4°, beginning from N.P.D. 48°, and, by applying the corrections to the Greenwich N.P.D.'s given in Dr. Auwers' paper before referred to, the corrections applicable to the Cape N.P.D.'s to reduce them to the standard have been obtained. The results are given in the following Table:—

N.P.D.	Gr. - C.	Standard - Gr.	Standard - C.
48	+ 0.59	- 0.21	+ 0.38
52	+ 0.57	- 0.30	+ 0.27
56	+ 0.54	- 0.39	+ 0.15
60	+ 0.51	- 0.38	+ 0.13
64	+ 0.48	- 0.40	+ 0.08
68	+ 0.46	- 0.44	+ 0.02
72	+ 0.45	- 0.47	- 0.02
76	+ 0.41	- 0.49	- 0.08
80	+ 0.35	- 0.41	- 0.06
84	+ 0.31	- 0.29	+ 0.02
88	+ 0.34	- 0.22	+ 0.12
92	+ 0.37	- 0.18	+ 0.19
96	+ 0.41	- 0.16	+ 0.25
100	+ 0.41	- 0.19	+ 0.22
104	+ 0.37	- 0.29	+ 0.08

N.P.D.	Gr. - C.	Standard - Gr.	Standard - C.
108	+ 0.30	- 0.36	- 0.06
112	+ 0.26	- 0.47	- 0.21
116	+ 0.20	- 0.36	- 0.16
120	+ 0.13	- 0.38	- 0.25
122	+ 0.13	+ 0.9	+ 1.0
124	+ 0.18	+ 1.4	+ 1.6

For the southern stars whose N.P.D.'s are greater then 120° I have compared the Cape Catalogue with Henderson's Catalogue of 172 stars published in the 10th volume of the *Memoirs*. Dr. Auwers uses the latter as a provisional standard for southern stars, as it appears from his investigation that, up to the zenith of the Cape, it does not differ much from his standard. The epoch of Henderson's Catalogue is 1833.0, and the places of the Cape Catalogue have been brought back to this date, using the precessions, secular variations, and proper motions given in the Catalogue, except in the case of β *Columbae*, for which I have used the proper motion given in the Melbourne General Catalogue for 1870 instead of that given in the Cape Catalogue, which is taken from the B.A.C. It has been assumed that Henderson has corrected his places for the proper motion corresponding to the fraction of the year; but this is not quite certain; he does not give either the mean date of observation or the adopted proper motion. However, as his observations only extend from May 1832 to May 1833, the correction is insignificant, except in the case of a few stars having large proper motions. I have used 67 stars which are common to the Catalogues, situated between N.P.D. 115° and the South Pole; and proceeding in the same manner as for the northern stars, I get the following Table:—

N.P.D.	Number of Stars.	H - C.	
		Computed.	Curve.
117 34	4	+ 0.74	...
123 47	5	+ 1.04	+ 0.96
128 24	5	+ 0.47	+ 0.53
132 3	9	+ 0.24	+ 0.23
137 51	7	- 0.40	- 0.21
143 2	3	- 0.16	- 0.10
147 50	9	+ 0.19	0.00
152 51	6	- 0.37	- 0.12
157 40	4	+ 0.13	- 0.13
167 7	3	- 0.21	- 0.15
172 52	5	- 0.28	- 0.24
178 26	7	- 0.21	- 0.22

The difference of the N.P.D.'s of these two Catalogues, as given above, are much more irregular than those of the Cape and Greenwich Catalogues; but this is no doubt owing to the inaccurate values of the proper motions of the southern stars which have been used. Mr. Stone considers that these proper motions may be 0''.02 or 0''.03 in error, which of course in 27 years would amount to a perceptible quantity. However, I have no doubt that the curve represents very fairly the systematic differences between the Catalogues as given by these observations.

As it might be considered that there were not sufficient materials for a trustworthy direct comparison between Henderson and the Cape Catalogue, I have also compared them indirectly by means of Johnson's St. Helena Catalogue. There are 202 stars available for the comparison of Johnson with the Cape, and Dr. Auwers has given the reduction of Johnson to Henderson derived from 149 stars. Johnson has not corrected his places for proper motion, except in a few instances given in the Notes, and has not given the mean dates of observation except in these cases. But as the observations extend from Nov. 1829 to April 1833 and are reduced to 1830.0, it has been assumed that 1832.0 may, in the mean, be taken as the mean date of observation, and 2 years' proper motion has been applied to every star, and then the place in the Cape Catalogue has been brought back to 1830.0. The result of the comparison is—

N.P.D.		Number of Stars.	J - C.	
°	'		Computed.	Curve.
122	17	34	+ 0.63	+ 0.52
127	27	26	+ 0.68	+ 0.77
132	19	26	+ 1.00	+ 0.69
137	31	23	+ 0.01	+ 0.42
142	51	14	+ 0.74	+ 0.51
147	32	19	+ 0.65	+ 0.50
152	27	15	- 0.32	+ 0.19
156	51	20	+ 0.55	+ 0.38
162	37	5	+ 0.67	+ 0.52
168	10	7	+ 0.26	+ 0.33
172	55	5	+ 0.24	+ 0.31
177	55	8	+ 0.47	+ 0.39

By applying Dr. Auwers' reduction of Johnson to Henderson and taking the mean of the direct and indirect comparison of Henderson and the Cape Catalogue, the final Table of reduction becomes—

N.P.D. °	H-C.		
	Direct. "	Indirect. "	Mean. "
120	+ 1'10	+ 1'37	+ 1'24
122	+ 1'05	+ 1'40	+ 1'23
124	+ 0'90	+ 1'43	+ 1'17
128	+ 0'60	+ 1'31	+ 0'96
132	+ 0'20	+ 0'85	+ 0'53
136	- 0'09	+ 0'30	+ 0'11
140	- 0'25	- 0'05	- 0'15
144	0'00	- 0'09	- 0'05
148	- 0'01	- 0'34	- 0'18
152	- 0'10	- 0'78	- 0'44
156	- 0'15	- 0'76	- 0'46
160	- 0'10	- 0'54	- 0'32
164	- 0'08	- 0'63	- 0'36
168	- 0'20	- 0'73	- 0'47
172	- 0'23	- 0'63	- 0'43
176	- 0'25	- 0'35	- 0'30
180	- 0'23	+ 0'07	- 0'08

Greenwich,
1878, December 9.

Professor Safford has kindly pointed out to me an *Erratum* in the proper motion in R.A. of 35 *Ceti*, as given in *Monthly Notices*, vol. xxxviii., p. 518. The corrected quantities are :

Mean Annual Motion	+ 3 ^s ·0661
Proper Motion in R.A.	- 0'·0142.

Greenwich,
1878, December 9.

Total Eclipse of the Sun, July 29, 1878.

By W. H. Pickering, Esq.

The eclipse was observed by me at Cherry Creek, two and a quarter miles south-west of Denver, Colorado. The instruments used were two Arago polariscopes (the same used by my brother, Professor E. C. Pickering, in 1869 and 1870) and a polarimeter lent me by Mr. Ranyard. The smaller polariscope consisted of a double-image prism and a selenite plate. It was twelve inches in length, one inch in diameter, and 4° 45' field, giving red and